THE INVENTION CLAIMED IS

1. A capacitive deionization - regeneration system comprising in combination:

(1) a battery of at least four electrochemical cells, each cell comprising at least one pair of adjacent electrodes including an electrosorptive medium having a high specific surface area and sorption capacity, formed on one or more surfaces of said electrodes;

each pair of said adjacent electrodes including at least one aperture; and

each pair of said adjacent electrodes forming an open channel, said open channel adapted to fluidly communicate with a subsequent open channel via said aperture to allow a fluid to flow across said electrosorptive medium and through the battery in a serpentine path,

(2) an electrical circuit for controlling the operation of said battery of cells, said electrical circuit adapted for switching the polarity of each pair of said electrodes during each deionization cycle of said cell; and

(3) a fluid circuit for regulating the flow of a fluid through said cell under the control of said electrical circuit, in order to maintain a continuous deionization and regeneration operation.

2. The system of claim 1 wherein said fluid circuit comprises an outlet for deionized fluid obtained from a deionization cycle operated at a positive polarity and a second outlet for deionized fluid obtained from a deionization cycle operated at a negative polarity.

3. The system of claim 1 wherein said electrical circuit adapted for electrostatically regenerating a fluid by shorting said cell or reversing said polarity of said cell.

4. The system of claim 1 wherein said electrosorptive medium of said electrodes attached by fastening strips.

5. The system of claim 3 wherein said electrodes comprise a carbon aerogel composite.

6. The system of claim 4 wherein said electrosorptive medium is composed essentially of any, or a combination of: carbon aerogel composite; a packed volume of particulate carbon, carbon aerogel, metal, or Buckminster fullerene; a carbide or a composite of carbides that are stable at high temperatures, chemically resistant, and highly conductive with a resistivity ranging between about 10 μohm-cm and 2000 μohm- cm, selected from a group consisting essentially of TiC, ZrC, VC, NbC, TaC, UC, MoC, WC, Mo_2C, Cr_3C_2, or Ta_2C; a packed volume of porous

titanium, platinum or other metal; a metal sponge, or metallic foam; reticulated vitreous carbon (RVC) impregnated in resorcinal/formaldehyde carbon aerogel; or a porous, conductive screen including an array of holes that have been photolithographically formed to optimize the volummetric specific surface area of said screen.

7. The method of claim 1 wherein a voltage above about 1.2 V to about 1.7 V is applied across said open channel.

8. A capacitive deionization - regeneration system comprising in combination:

at least two batteries of electrochemical cells, at least one of said batteries comprising at least three pair of electrodes wherein at least one pair of said pairs comprise electrodes that are spaced apart and positioned in a generally parallel relationship relative to each other for defining an open channel there between, and for allowing a free, unobstructed flow of fluid through said open channel, said open channel having no dimension open to the exterior of said cell, said electrodes comprising a bed of electrosorptive medium having high specific surface area and sorption capacity;

an electrical circuit for controlling the operation of said at least two batteries, said electrical circuit adapted for switching the polarity of each electrode of said pairs during each deionization cycle of said cell; and

a fluid circuit for regulating the flow of a fluid through said at least two batteries under the control of said electrical circuit, in order to maintain a continuous deionization and regeneration operation.

9. The system of claim 8 wherein said fluid circuit comprises said open channel having a serpentine path through said cells.

10. The system of claim 8 wherein said electrical circuit adapted for electrostatically regenerating a fluid by shorting said cells or reversing said polarity of said cells.

11. The system of claim 8 wherein at least one of said electrodes comprising: a structural support member, a conductive layer formed on at least one surface of said support member, a sheet of said high specific surface area electrosorptive medium secured to said conductive layer, and said support member including at least one aperture for allowing a fluid to flow through the electrode.

12. The system of claim 11 wherein said structural support member includes any of: a conductive substrate formed at least in part of any of titanium, platinum or other metal; or a dielectric substrate formed of any of printed circuit board material, epoxy board, or glass epoxy board.

13. The system of claim 8 wherein said electrosorptive medium comprises any, or a combination of: carbon aerogel composite; a packed volume of particulate carbon, carbon aerogel, metal, or Buckminster fullerene; a carbide or a composite of carbides that are stable at high temperatures, chemically resistant, and highly conductive with a resistivity ranging between about 10 μohm-cm and 2000 μohm- cm, selected from a group consisting essentially of TiC, ZrC, VC, NbC, TaC, UC, MoC, WC, Mo_2C, Cr_3C_2, or Ta_2C; a packed volume of porous titanium, platinum or other metal; a metal sponge, or metallic foam; reticulated vitreous carbon (RVC)

impregnated in resorcinal/formaldehyde carbon aerogel; or a porous, conductive screen including an array of holes that have been photolithographically formed to optimize the volummetric specific surface area of said screen.

14. The system of claim 8 wherein a voltage of above about 1.2 V to about 1.7 V is applied to said open channel.

15. The system of claim 1 wherein an insulating spacing screen is positioned between said adjacent electrodes.

16. The system of Claim 15 wherein said insulating spacing screen comprises a material selected from the group consisting of polypropolene, polyethylene and Teflon®.

17. The system of Claim 1 wherein at least one of said adjacent electrodes comprises two or more surfaces of said electrosorptive medium that is adapted to contact an electrolyte.

18. The system of claim 8 wherein an insulating spacing screen is positioned between said adjacent electrodes.

19. The system of Claim 18 wherein said insulating spacing screen comprises a material selected from the group consisting of polypropolene, polyethylene and Teflon®

20. The system of Claim 8 wherein at least one of said adjacent electrodes comprises two or more surfaces of said electrosorptive medium that is adapted to contact an electrolyte.

21. An electrode comprising:

a structural support member,

a conductive layer formed on at least one surface at said support member, and

a sheet of an electrosorptive medium secured to said conductive layer at contact locations comprising a surface area less than a total surface area of said sheet.

22. The electrode of Claim 21 wherein said support member includes at least one aperture for allowing a third to flow through said electrode.

23. The electrodes at Claim 22 wherein said electrosorptive medium is secured to said conductive layer by a conductive bonding material.

24. The electrode of Claim 23 wherein said conductive bonding material comprises an epoxy material.

25. The electrode of Claim 21 in combination with an insulator spacing screen between said electrode and a second electrode.

26. The electrode of Claim 25 wherein said insulator spacing screen is positioned between said eletrosorptive medium and electrosorptive medium secured to said second electrode.